

MEASUREMENT OF ACTIVATION CROSS SECTIONS OF THE PROTON-, DEUTERON- AND ALPHA PARTICLE INDUCED NUCLEAR REACTIONS ON PLATINUM

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First motivation for measurements of excitation functions of proton, deuteron and alpha induced nuclear reactions on platinum started with determination the possible impurities in investigation of excitation functions on noble metal targets (Pd, Au, Ir). It was supported further by our wear studies on samples containing significant Pt component (¹⁹⁵Au, ¹⁹⁶Au). Knowledge of excitation functions has significance for production of medically related radioisotopes (¹⁹⁸Au, ¹⁹⁹Au, ¹⁹¹Pt, ^{193m}Pt, ^{195m}Pt). Activation data are required for accelerator and target technology and for dose calculations. Production cross-sections and isomeric ratios have importance for reaction mechanism studies.

Searching of the literature practically no earlier experimental activation cross-section data were found. The excitation functions on platinum have been measured by using standard stacked foil irradiation method and high resolution gamma-ray spectroscopy. Thin Pt foils were stacked with Al and Cu and Ti monitor foils and irradiated at the cyclotrons of the Tohoku University (proton) and of the Vrije Universiteit Brussel (proton, deuteron and alpha). Several stacks were irradiated by covering overlapping energy ranges for the Pt targets. Large number of the monitor foils makes possible to follow the beam intensity and the energy degradation along the whole stack via the monitor reactions (^{nat}Al(p,x)^{22,24}Na, ^{nat}Cu(p,x)^{56,58}Co, ^{62,65}Zn, ^{nat}Ti(d,x)⁴⁸V, ^{nat}Cu(α,xn)^{66,67}Ga, ⁶⁵Zn).

Direct and cumulative cross-sections were calculated from the parameters of the bombarding beam, of the target and the corresponding decay data. As a result: experimental cross-sections, derived integral yields and activation curves will be reported and compared with the theoretical calculations performed by the Alice-IPPE code for the following reactions:

^{nat}Pd(p,x) ^{191,192,193,194,195,196m,196g,198g}Au, ^{188,189,191,195m}Pt, ^{189,190,191}Ir up to 70 MeV
^{nat}Pd(d,x) ^{192,193,194,195,196m,196}Au, ^{191,195m,197}Pt, ^{189,192}Ir up to 21 MeV
^{nat}Pd(α,x) ^{191m,191g,192,193m,193g,195m,195g,197m,197g}Hg,
^{192,193m,193g,194,195m,195g,196m,196g,198m,198g,199,200m}Au, ^{195m,197m,197g}Pt up to 38 MeV